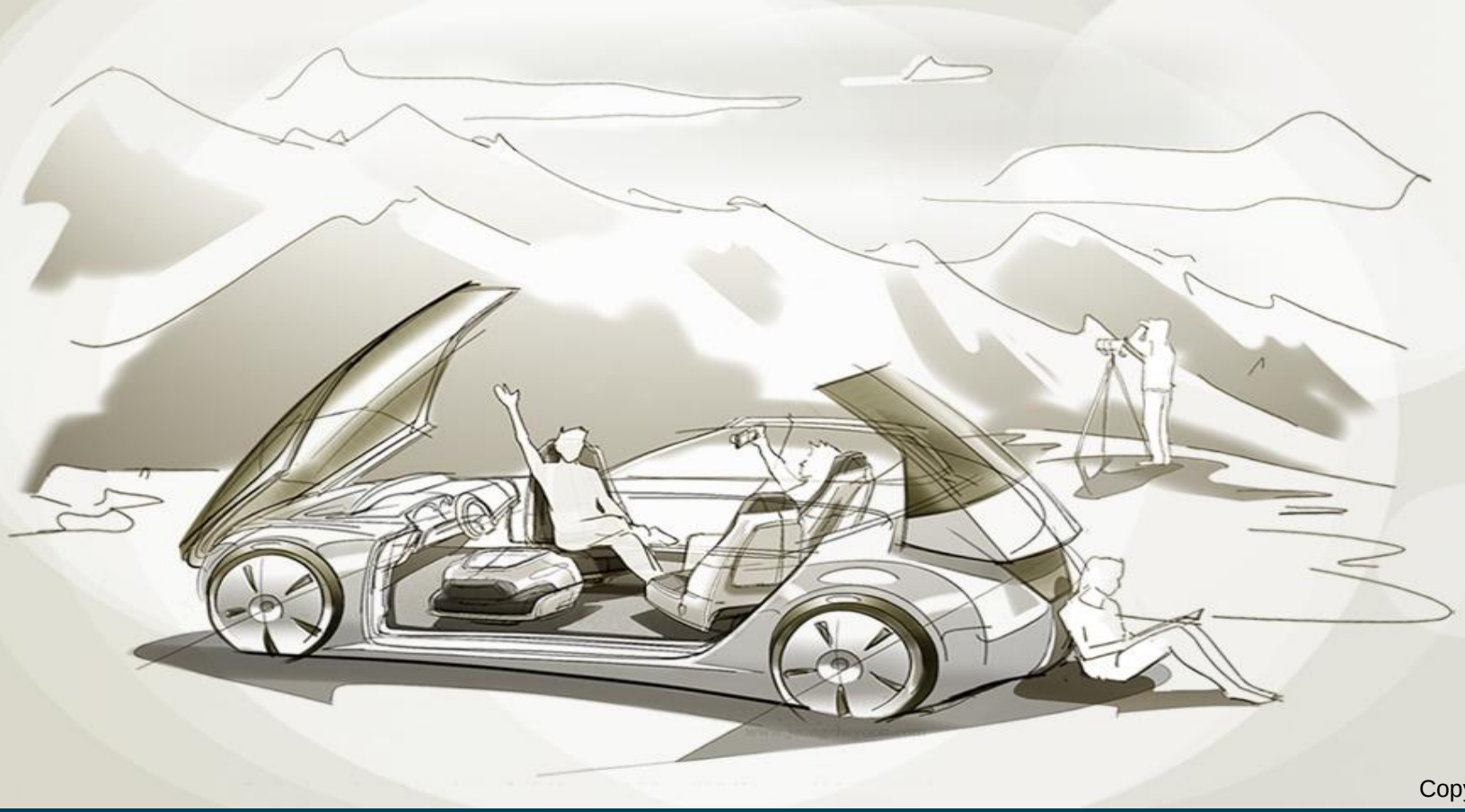




# Automotive landscape 2025: Opportunities and challenges ahead

March 2011 (Short Version)

Amrop

Roland Berger
Strategy Consultants

# A. Management summary

Roland Berger
Strategy Consultants

# Automotive landscape 2025: trends and challenges – management summary of the key findings (1/2)

Key findings of the automotive 2025 study

1 **SHIFT TO ASIA**

There will be a **dramatic shift** of **sales & production capacity** to Asia – regional trade blocs expected to grow, leading to shift toward **low-cost locations. 300,000 jobs in Europe at risk**

2 **SMALL IS BEAUTIFUL**

**A/B segment** with **disproportionately strong growth**. At the same time extremely successful **low-cost cars** answer the rising demand for no-frills transportation – **a global phenomenon**

3 **DEMOTORIZATION**

Especially among younger people, the **car loses its pole position in** their **emotional preferences** – the **motorization rate** is **decreasing in big cities**, and by 2025 not just in mature industrial nations

4 **POWERTRAIN ELECTRIFICATION**

In the most positive of all cases, **electric vehicles** will account for **~10% of new vehicle sales by 2025**, hybrids will reach 40% share – **internal combustion engines** will **still** account for **50%**

5 **ALWAYS ONLINE, ALWAYS CONNECTED**

By **2025,** many **vehicles will be always online**, sending and receiving information: Connectivity is a key factor – but **intelligent traffic solutions** will **remain** a **vision well beyond 2025**

Source: Roland Berger

# Automotive landscape 2025: trends and challenges – management summary of the key findings (2/2)

Key findings of the automotive 2025 study

6 **NEW BUSINESS MODELS**

Established players have to **deal with low-cost challengers, technology challengers** and the rise of **new business models:** mobility ecosystems incl. car sharing have to be taken seriously by 2025

7 **LACK OF ENGINEERS & SPECIALISTS**

Countries with aging populations are lacking in engineers & specialists, esp. when it comes to STEM subjects – **OEMs/OESs cannot significantly increase their R&D departments abroad**

8 **"GLO/CAL" BUSINESS ORGANIZATIONS**

Successful global players will **move away from centralized organizations**: global at a local level – In 2025 these companies will have a number of **regional HQs to adjust & act fast locally**

9 **INDUSTRY FLEXIBILIZATION**

The **automotive industry needs** to open up and be able to **learn from other industries**, e.g. IT, suppliers – it will be the **most flexible businesses** that **survive**

10 **PROLIFERATION MEETS CONSOLIDATION**

**While** the **consolidation trend** will continue **among OESs, OEMs** are **likely to see** a **(re-) proliferation. New players**, including those from outside the industry, **will emerge**

Source: Roland Berger

# B. Study design

Roland Berger
Strategy Consultants

# We conducted more than 60 expert interviews to verify the megatrends and their implications

## Selected interview partners

*INTERVIEW FOCUS ON IMPLICATIONS*

### OEMs (PC)

- SAIC
- BYD
- FAW
- Geely
- Nissan
- Renault
- PSA
- Detroit Electric
- Volkswagen
- Daimler
- BMW
- Fiat
- GM
- Ford
- Chrysler
- Hyundai
- KIA

### OESs

- Denso
- Magneti Marelli
- Fiat Powertrain
- A123 Systems
- Schaeffler
- TRW
- Valeo
- Iochpe-Maxion
- Faurecia
- Michelin

**Implications and recommen-dations**

*INTERVIEW FOCUS ON TRENDS*

### Administration + think tanks

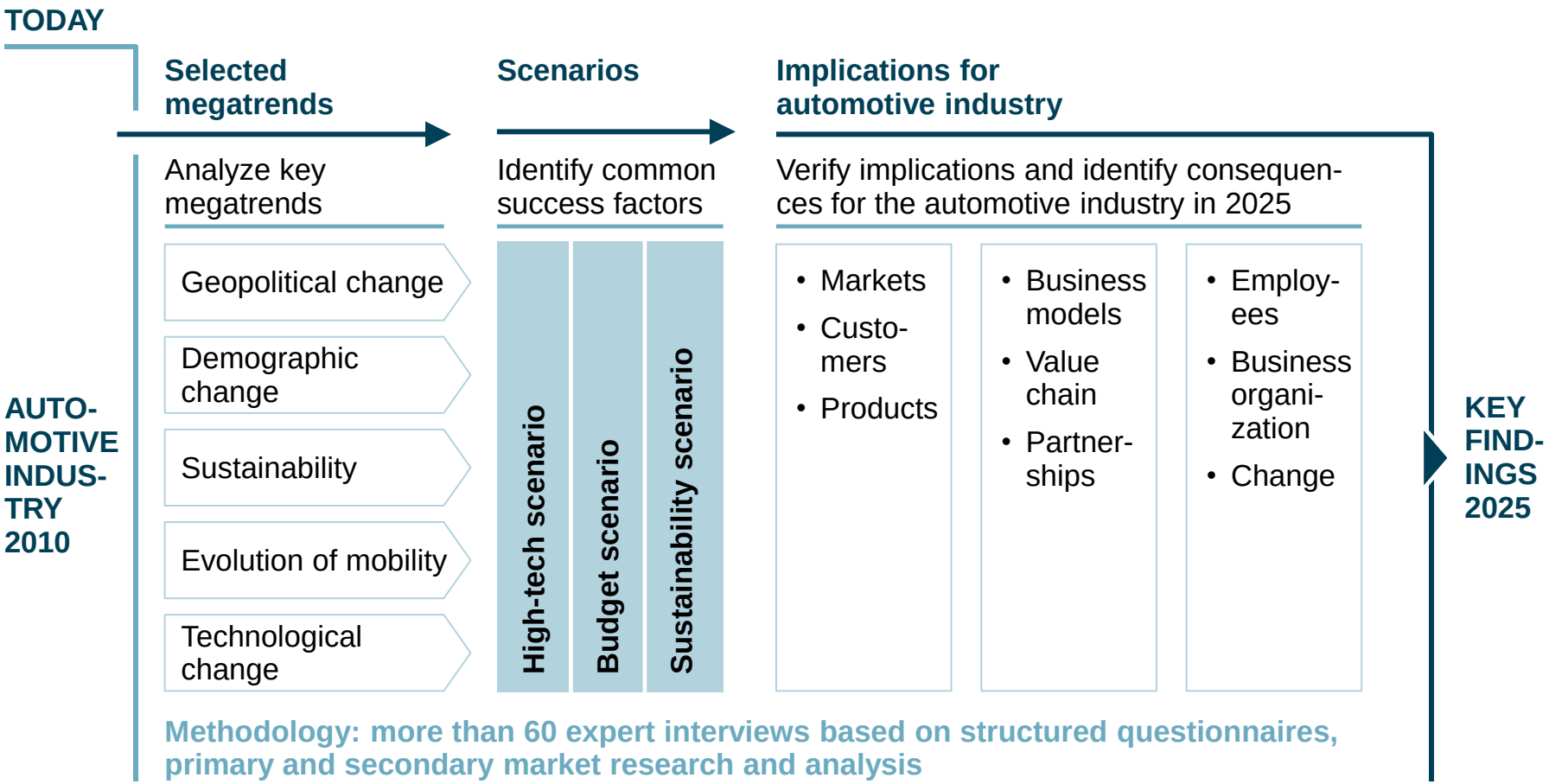
- EU Commission
- Chicago Dept. of Energy
- MLIT
- City of Tokyo
- City of Berlin
- City of Mexico
- Deutsche Bank
- Merrill Lynch
- IFO Institute
- Rocky Mountain Institute
- University of Ulm
- VDA
- BMWi
- Greenpeace
- CATARC
- World Bank

### Third parties

- Google
- Auto.de
- Sixt
- Enel
- EON
- Facileasing
- Emil Frey
- Albert Speer
- GMP Architects
- Better Place

Source: Roland Berger

# Five key megatrends will shape the automotive industry in 2025




Source: Roland Berger


# C. Implications

Roland Berger
Strategy Consultants

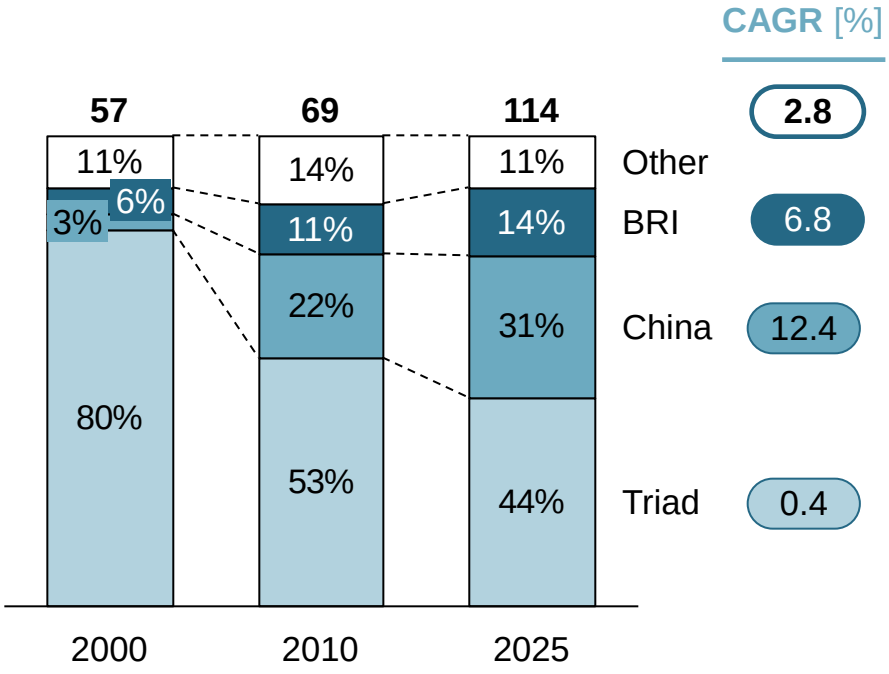
# C. SHIFT TO ASIA

Roland Berger
Strategy Consultants

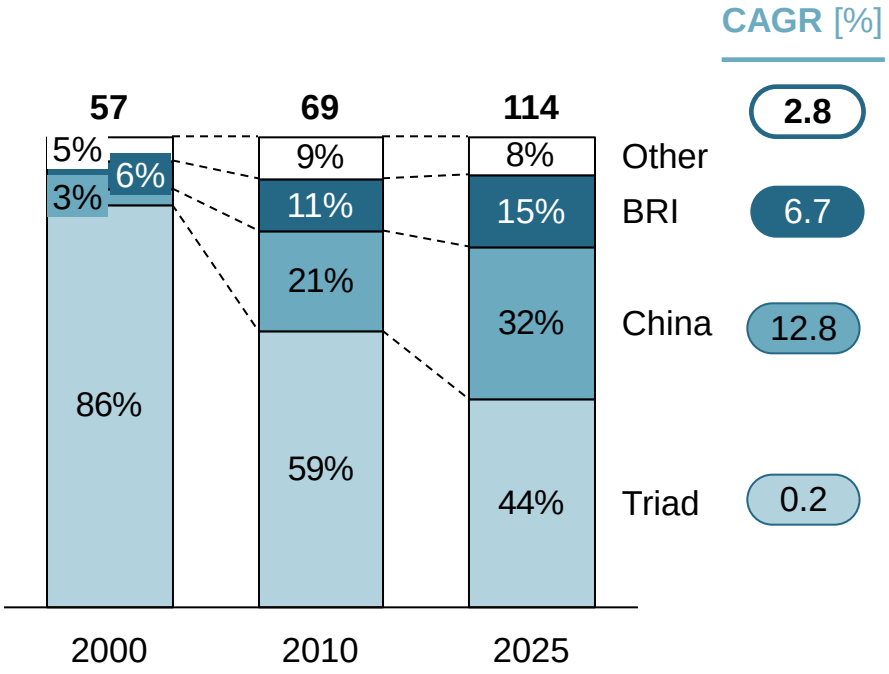
# Sales and production are further shifting to BRIC countries – China will be a major sales and production hub in 2025

Sales and production of light vehicles by region, 2000-2025 [m units]

## Sales



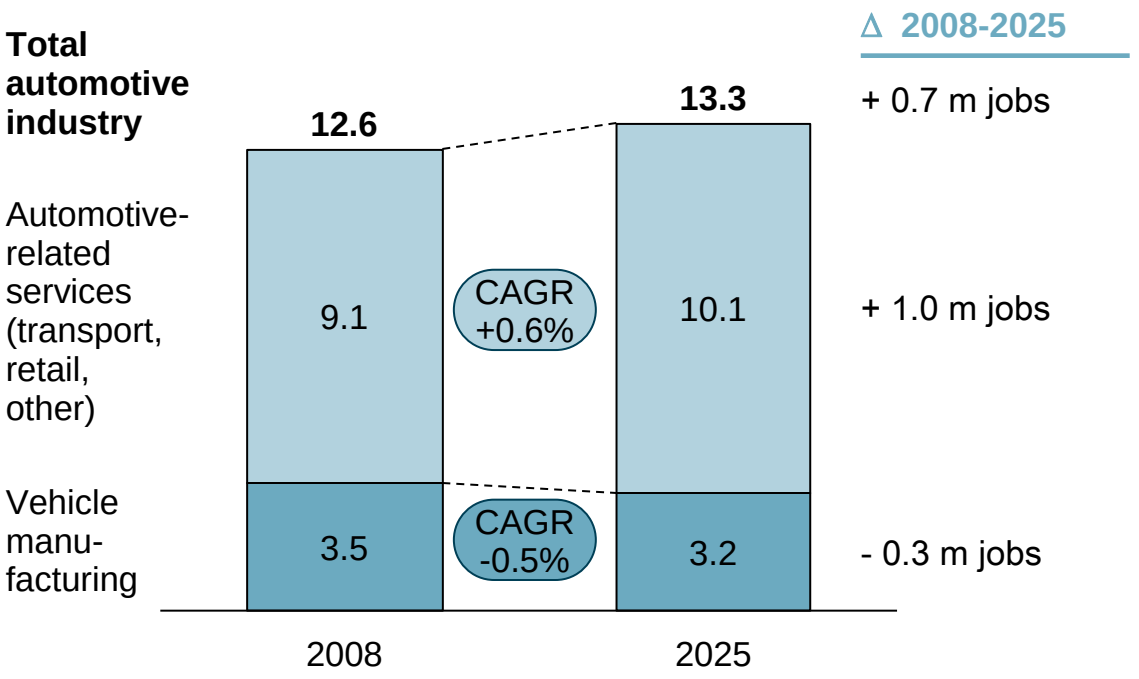

## Production




Source: Roland Berger

# The shift of production capacity to growing markets and low-cost centers could affect about 300,000 European jobs until 2025

Automotive-related employment in Europe 2008-2025 [m]




## COMMENTS

- Employment in automotive manufacturing expected to decrease by 300,000 jobs. That equals a 9% drop
- In associated industries (services) the employment is projected to increase by 1 million workplaces
- The overall effect will be the creation of 700,000 new posts around the automotive industry

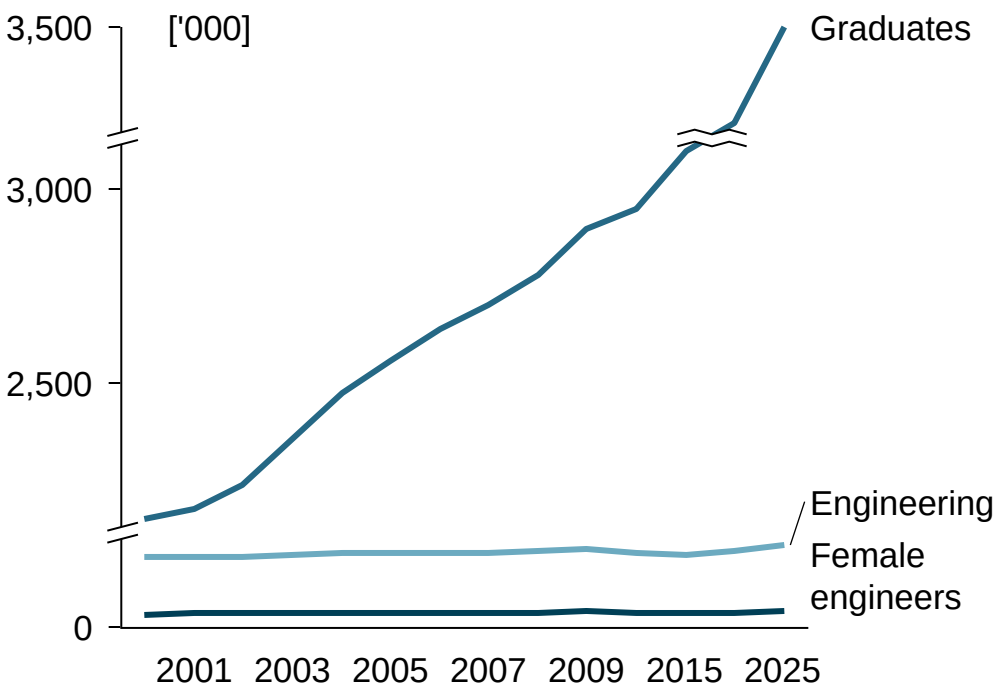
Source: ACEA, Prognos; AAA; VDA, Global Insight; Eurostat; Roland Berger

# C. LACK OF ENGINEERS AND SPECIALISTS

Roland Berger
Strategy Consultants

# The STEM issue: statistics indicate a growing gap of qualified engineers and developers in mature markets

## Example – Development of engineering graduates in the US




### COMMENTS

- Despite a growing number of university graduates in the US the share of graduates in engineering fell from 8.5% in 1999 to 7.0% in 2008
- Female graduates are relatively stable at about 19.0% of all engineering graduates in the US

STEM: science, technology, engineering and mathematics

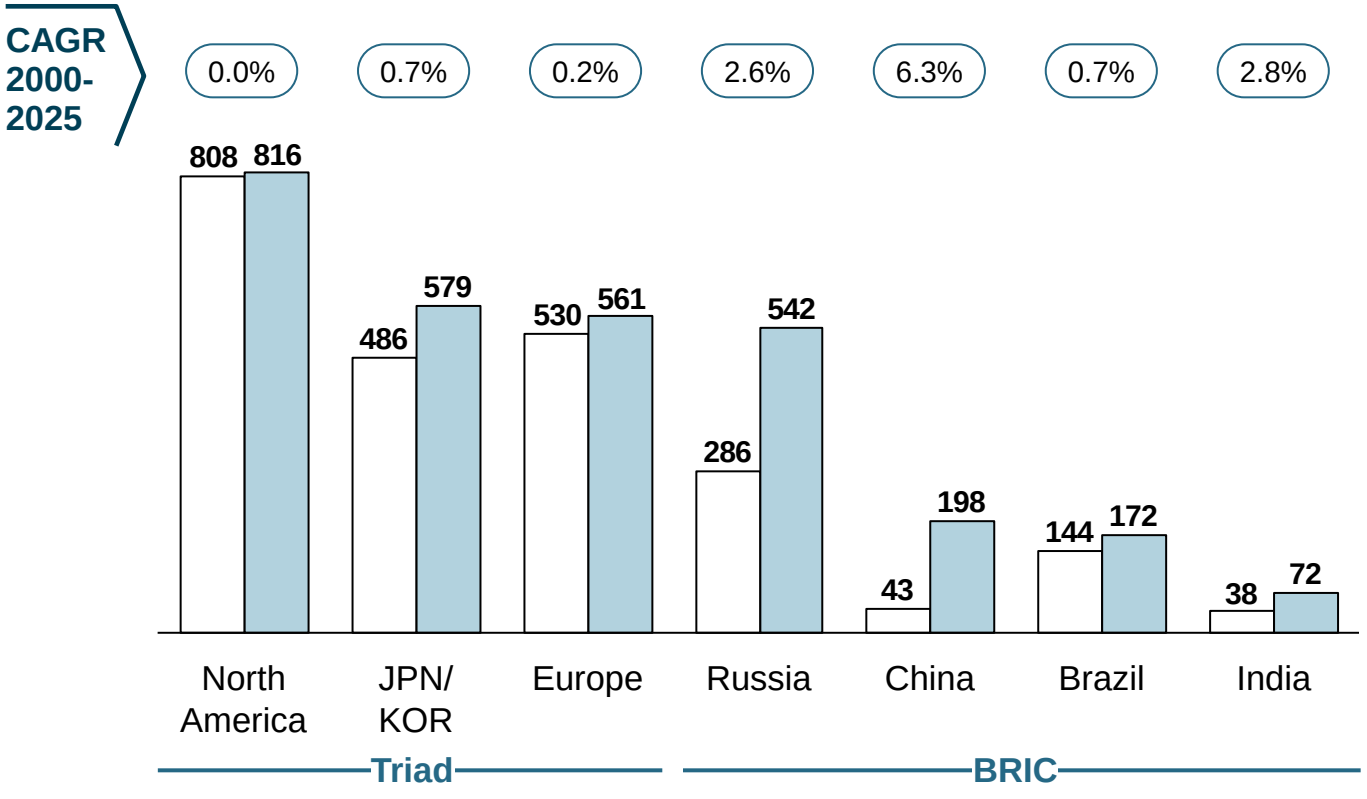
Source: AMROP, Roland Berger

# C. SMALL IS BEAUTIFUL

Roland Berger
Strategy Consultants

# With the growing population and growing wealth in the BRIC markets, the overall motorization rate will increase until 2025

## Cars per 1,000 inhabitants ['000 vehicles]



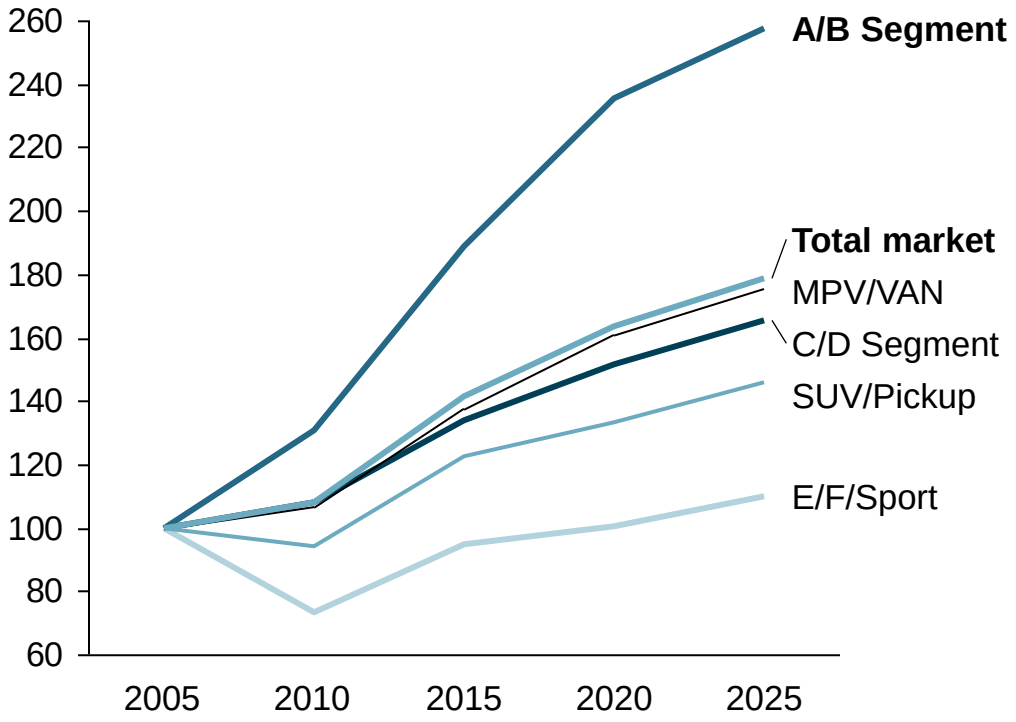

## COMMENTS

- Annual growth in triad markets between 0% and 0.7%
- Much stronger growth in BRIC markets, ranging from 0.7% to 6.3% annually
- 83.0% of the market growth expected to happen in BRIC markets

Source: J.D. Power; Roland Berger

# A/B segment is forecast to achieve the highest growth rates of all vehicle segments by 2025

## Car sales index by segment [2005-2025, 2005=100]




## COMMENTS

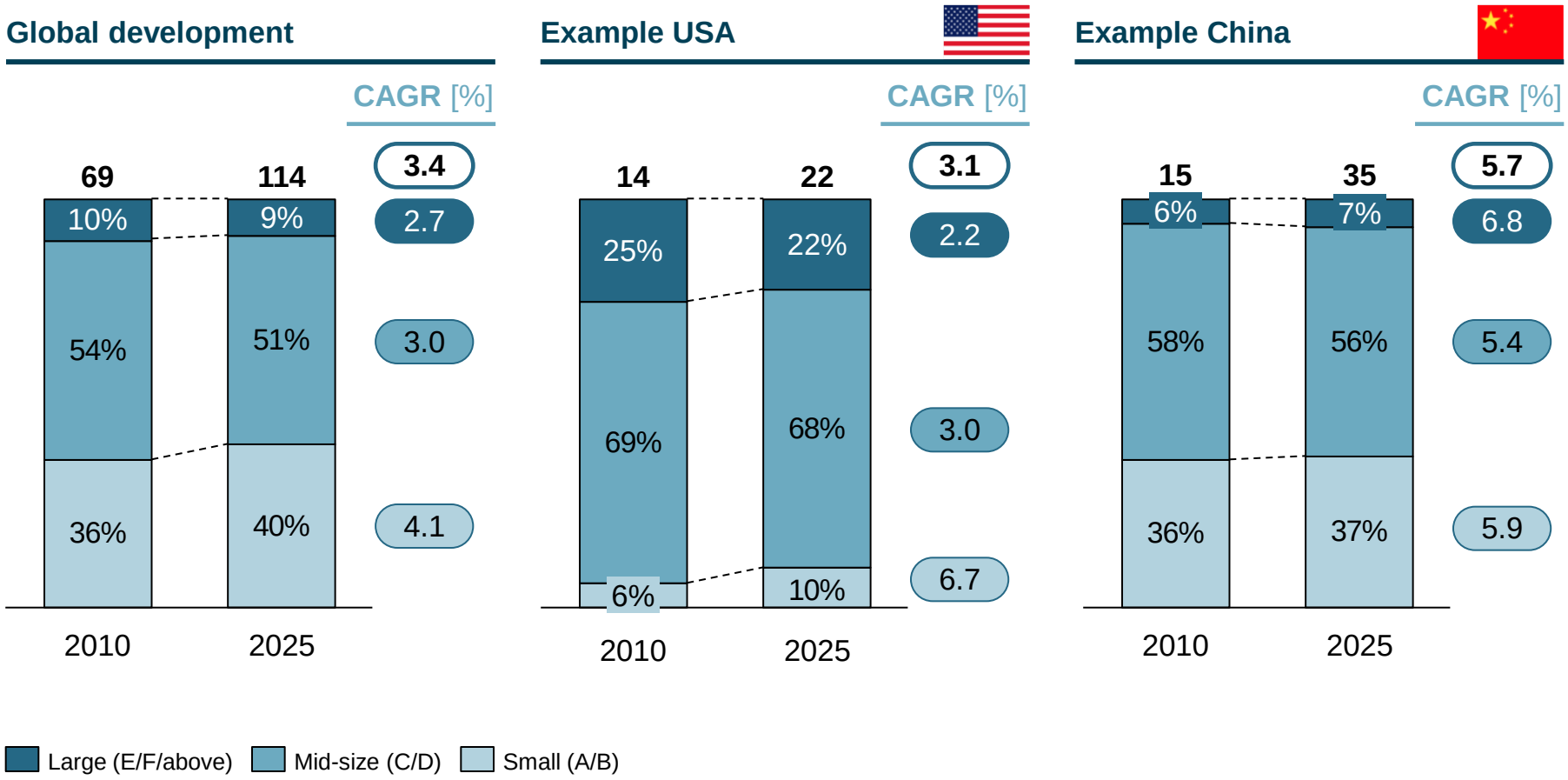
**Reasons why A/B segments** are the **main drivers** of **future market growth:**

- **Features**: A/B vehicles already offer features typically associated with upper segments – Example Audi A1's dual-clutch transmission
- **Safety**: More small cars achieve 5 stars at the NCAP crash tests – e.g. VW Polo, Suzuki Swift, Hyundai i20
- **Driving experience:** Difference in driving compared to upper segments diminishing
- **Efficiency**: A/B segment car have small engines and offer better fuel efficiency
- **Dimensions**: A/B vehicles have grown in terms of size and will likely grow further (Fiat Grande Punto)

Source: J.D. Power; Roland Berger

# Small vehicles will grow fastest across the globe – China to follow suit from 2025 onward

Light vehicles sales by segment, 2010-2025 [m units; %]




Source: JD Power; Roland Berger

# C. DEMOTORIZATION

Roland Berger
Strategy Consultants

Amrop

Roland Berger
Strategy Consultants

# A trend toward "demotorization" is developing mainly among the younger generation in industrial countries

## Example: Japan – Ranking of interests of university students [%]

### Past students (now in 40s, 50s)

*No of interests (avg.): 5.22*

| Rank | Products/Services | N=300 |
|---|---|---|
| 1 | Fashion | **35.7** |
| 2 | Domestic travel | **34.0** |
| 3 | Dining out | **32.0** |
| 4 | Reading | **31.7** |
| 5 | Music | **31.3** |
| 6 | Movies | **27.7** |
| 7 | **Cars** | **27.0** |
| 8 | PC | 25.7 |
| 9 | Foreign travel | 23.7 |
| 10 | Audio | 20.3 |
| 11 | Camera | 19.7 |
| 12 | TV | 17.0 |
| 13 | Animation, Manga | 15.7 |
| 14 | Jewelry | 15.0 |
| 15 | Sports goods | 14.0 |
| 16 | Cosmetics, Beauty salon | 12.3 |
| 17 | Watches | 11.3 |
| 18 | Licentiates, Learning | 10.3 |
| 19 | Portable Music Players | 10.0 |
| 20 | Motorcycles | 9.7 |

### Past students (now in 20s, 30s)

*No of interests (avg.): 7.09*

| Rank | Products/Services | N=300 |
|---|---|---|
| 1 | PC | 50.7 |
| 2 | Fashion | 47.7 |
| 3 | Communication devices | 39.7 |
| 4 | Domestic travel | 37.3 |
| 5 | Music | 37.0 |
| 6 | Dining out | 33.7 |
| 7 | Foreign travel | 32.7 |
| 8 | Portable Music Players | 31.0 |
| 9 | Reading | 31.0 |
| 10 | **Cars** | **25.3** |
| 11 | Movies | 25.3 |
| 12 | Animation, Manga | 25.3 |
| 13 | Video games | 25.3 |
| 14 | Camera | 25.0 |
| 15 | Watches | 24.3 |
| 16 | Cosmetics, Beauty salon | 22.0 |
| 17 | TV | 18.7 |
| 18 | Jewelry | 18.3 |
| 19 | Licentiates, Learning | 15.0 |
| 20 | Audio | 14.3 |

### Current students

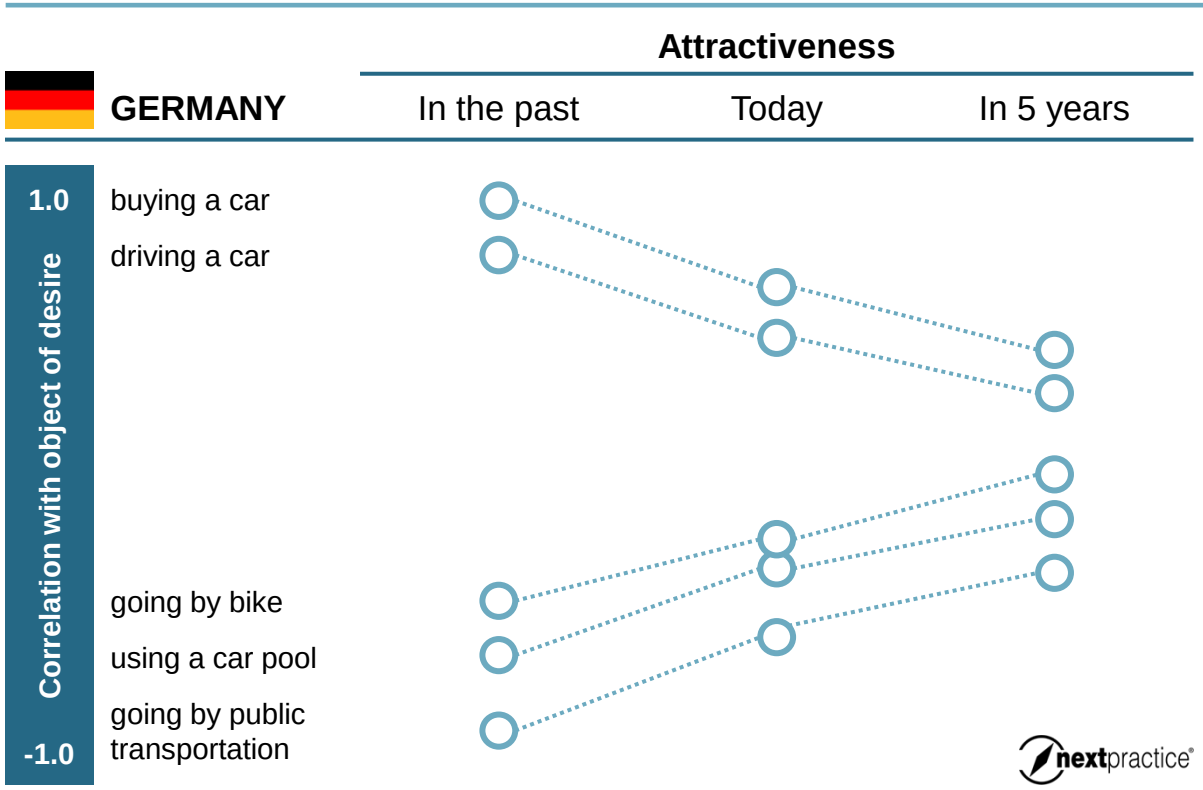
*No of interests (avg.): 8.96*

| Rank | Products/Services | N=1,000 |
|---|---|---|
| 1 | PC | 62.1 |
| 2 | Fashion | 53.9 |
| 3 | Portable Music Players | 50.6 |
| 4 | Communication devices | 49.9 |
| 5 | Domestic travel | 44.0 |
| 6 | Music | 43.7 |
| 7 | Reading | 42.9 |
| 8 | Animation, Manga | 42.0 |
| 9 | Video games | 38.4 |
| 10 | Dining out | 37.6 |
| 11 | Movies | 35.5 |
| 12 | Camera | 35.0 |
| 13 | Foreign travel | 33.9 |
| 14 | TV | 28.8 |
| 15 | Licentiates, Learning | 27.3 |
| 16 | Cosmetics, Beauty salon | 26.2 |
| 17 | **Cars** | **22.8** |
| 18 | Watches | 22.6 |
| 19 | Furniture, Interiors | 21.7 |
| 20 | Jewelry | 17.9 |

Source: JAMA (Market research of personal vehicles, 2008)

# In the emotional preferences of the young Germans surveyed, the car is losing its pole position vs. other mobility concepts

## Youth Study: Vehicle attractiveness – Germany, 2010 (n = 50)



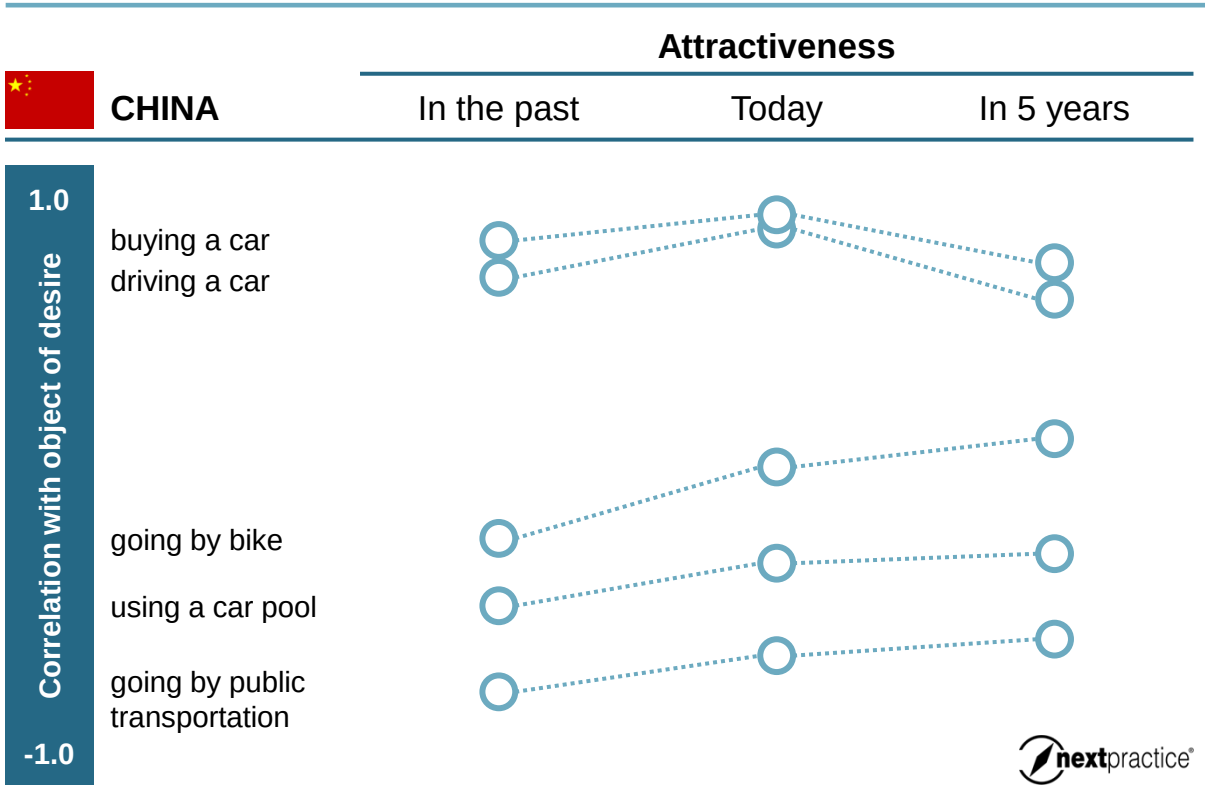

## COMMENTS

- The young people interviewed predicted a dramatic loss in car's attractiveness as a mobility concept in Germany
- Alternative solutions to manage personal mobility are steadily strengthening their competitive position relative to the car

Source: nextpractice GmbH for Roland Berger

# Young people from Shanghai are expected to follow the Germans in development of preferences: Cars become less attractive

## Youth Study: Vehicle attractiveness – Shanghai, 2010 (n = 50)




## COMMENTS

- The young Chinese interviewed saw the emotional pole position of the car still growing in China today
- However, they predicted that the cars's attractive-ness as a mobility concept will soon reach a turning point

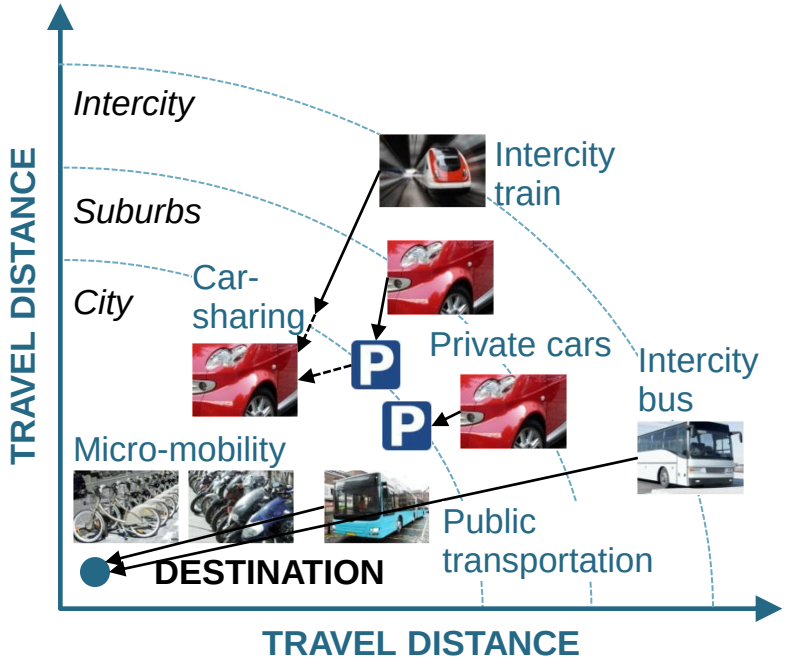
Source: nextpractice GmbH for Roland Berger

Amrop

Roland Berger
Strategy Consultants

# Usage instead of ownership: car sharing & fractional ownership as a growing model to fulfill modern mobility demands

## Integration of sustainable mobility solutions




## CAR SHARING

- Car sharing can provide the first- & last-mile connectivity for congested urban areas until micro-mobility solutions such as electric-assist bicycles or electric two-wheelers gain mass acceptance
- Example ZIPCAR (USA) the world's largest car sharing service:
  - Founded 2000, going public 2011
  - 6,500 cars and 280,000+ drivers
  - Available in 50+ cities and 100+ universities
  - Growth by M&A (Spain, UK)

zipcar


Source: Roland Berger

# C. ALWAYS ONLINE, ALWAYS CONNECTED

Roland Berger
Strategy Consultants

# Always online: Digitization changed the way business is done and continues to do so – Next step in development are cloud services

Online development and selected business aspects

| Yesterday | Today | Tomorrow |
|---|---|---|
| WEB 1.0 | WEB 2.0 | WEB 3.0 |

## E-COMMERCE

*"Delivery of information and goods"*

- Up-to-date website and shop, seamless transactions
- Well presented information on company and goods
- Good position in search engines

## SOCIAL MEDIA

*"Community building and user participation"*


- Suitable social media strategy and building of communities
- Support of marketing and sales activities with social media
- Usage of the customer insights gained

## CLOUD SERVICES

*"Mobile connectivity and open innovation"*

- Endlessly scalable resources (pay per use)
- Offer of mobile connected devices (e.g. cloud printing)
- Analysis and usage of cloud related data

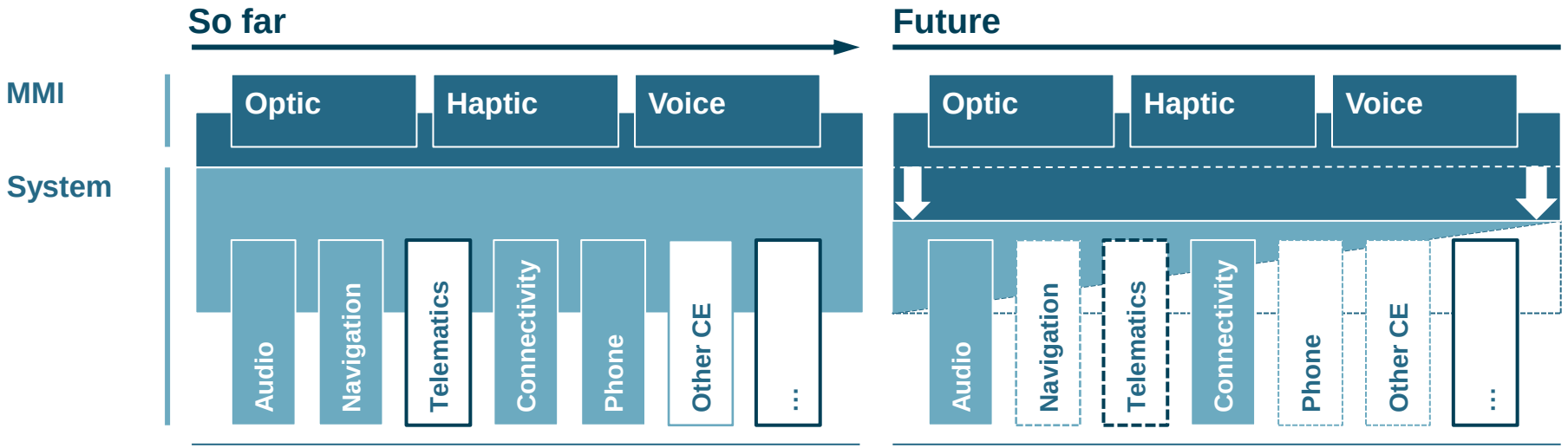
Source: Roland Berger

Amrop

Roland Berger
Strategy Consultants

# Connectivity car-to-driver (C2D): Standardization & increasing CE integration reduces influence of traditional system players

Illustrative development of automotive consumer electronics integration




**Implica-tions**

- **OEMs** are defining **MMI logic** and consumer **interface**
- **System providers** develop **platform** based on OEM specs and are responsible for **integration** – often including **"core applications"** (e.g. navigation)

- **Especially premium OEMs** are **still** defining **HMI logic** and **customer interface**
- **Platform** will be **standardized**, with OEMs increasingly assuming integrator role
- **Applications** will even **migrate out of the car** – thus, also **reducing value share** for Tier 1 "core applications"

OEM influence | "System supplier" influence | Other players | Vehicle integrated | "Decoupled"

CE: Consumer Electronics MMI: Man Machine Interface

Source: Roland Berger

# Advancements in technology expected to create a fully intelligent and connected transportation system – But not before 2025

## Intelligent vehicles

- Collision notification
- Collision warning
- Driver assistance
- Auto-pilot vehicles

## Intelligent infrastructure

- Traveler information
- Electronic pay system
- Incident management
- Arterial management
- Freeway management
- Transit management systems
- Emergency management systems
- Commercial vehicle operations
- Intermodal freight
- Crash prevention and safety
- Roadway operations & maintenance
- Roadway weather management
- Information management

Source: ITSA.org, Roland Berger

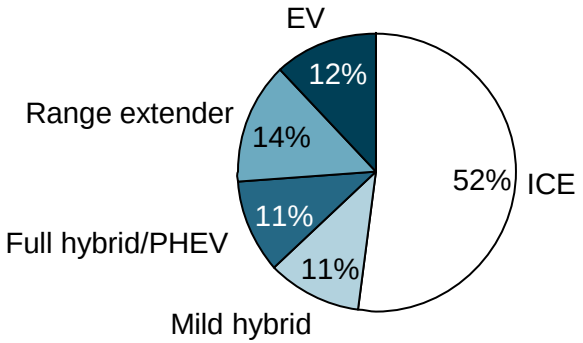
# C. POWERTRAIN ELECTRIFICATION

Roland Berger
Strategy Consultants

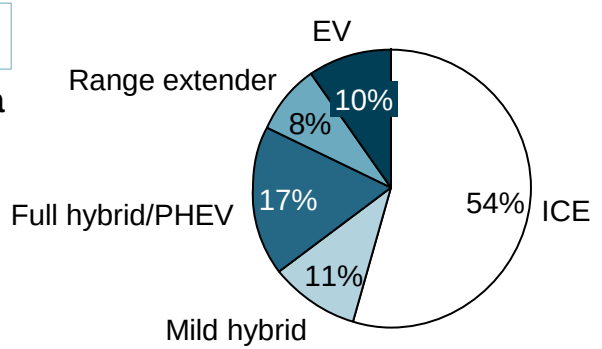
# The penetration of EVs and hybrids could exceed 40% in triad markets by 2025 – But the ICE powertrain will continue to dominate

## Powertrain hybridization/electrification scenario in major regions – 2025[1)]

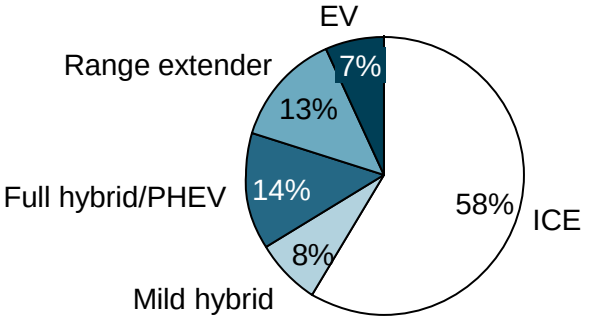
**Europe**



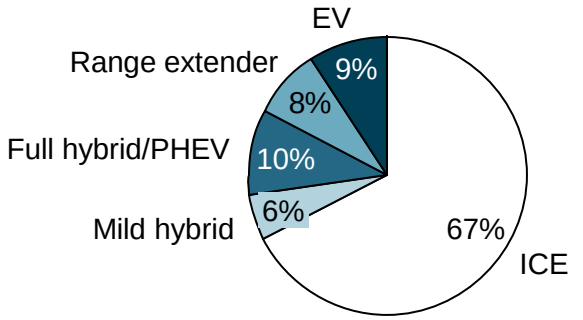

**Japan/Korea**




**North America**




**China**




1) Assumption: ICE includes micro hybrid functionality

Source: Roland Berger

# C. NEW BUSINESS MODELS

Roland Berger
Strategy Consultants

# The economics of electric vehicles open up new ways for consumers to think about and pay for mobility

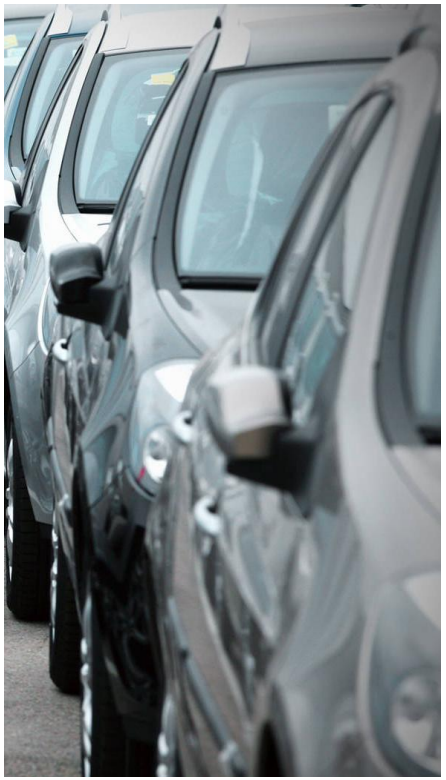
## Business models

### Vehicle without battery

- Option considered by some leading OEMs
- Battery supplied to customer via preferred partner

### Vehicle including battery

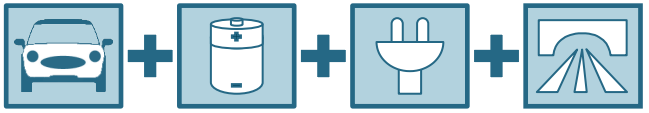
- Vehicle and battery supplied by OEMs
- Battery can be sold, financed or leased



### Vehicle + energy

- Monthly fee includes full maintenance service, electricity and insurance

### Integrated mobility



- Monthly fee includes additional value-added services, e.g. communications, parking access, …

Source: Roland Berger

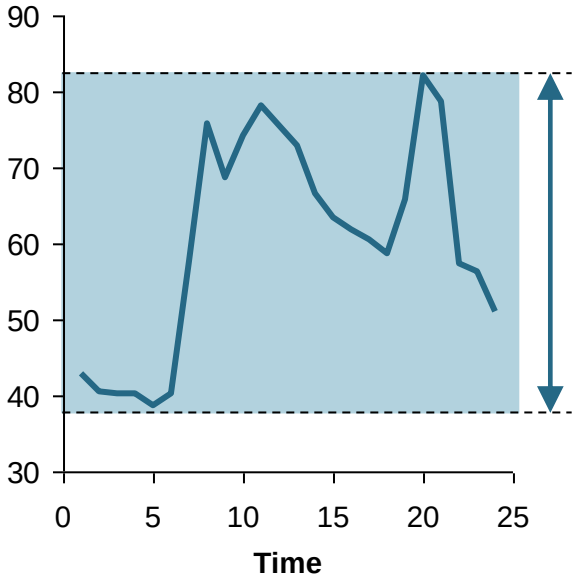
# Volatile energy prices will provide the basis for new business models

Example: Domestic power stations by green power provider Lichtblick AG

## Electricity market

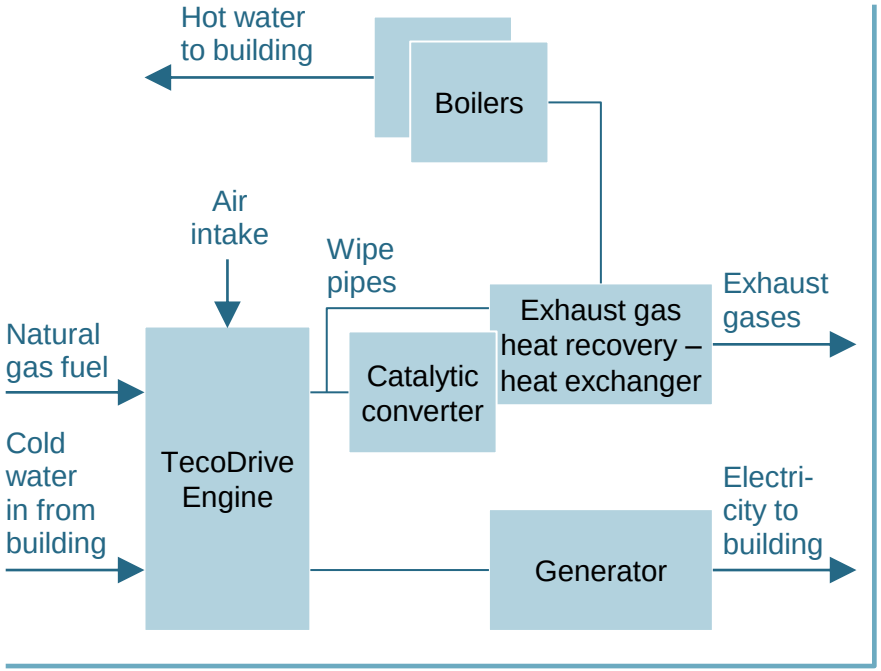
**Hourly average market prices 13.10.2010**

**[EUR/MWh]**




## Lichtblick AG business model

**Cogeneration plant for each household**




## COMMENTS

- Idea: use price fluctuation as an advantage
- Lichtblick AG wants to install 100,000 domestic gas fired power plants in Germany
- Cogeneration plants sell power back to the grid when the price is good while heating a house-hold's water
- Cogeneration plants are >90% efficient

Source: Lichtblick AG, Roland Berger

# Established players have to deal with "low-cost", "technology" & "business model" challengers – Competition will increase

## Overview

### Business model challenger

- RWE in Germany is considering a **new business model providing full customer service for EVs**:
  - Provision of **energy solutions**
  - **Passenger car sales** with OEM partners, e.g. BYD
- In this context close **collaboration with standardization organi-zations** & related market players

### Low-cost challenger

- **Tata developed very low-priced cars** and gained fast market access in India, China etc. by **offering 8 different models**
- **Cooperates with intern. suppliers** to develop low-pricde components with fewer requirements
- **Tata bought JLR** to get technology know-how and also **access to mature markets**

### Technology challenger

- **Successfully entered the passenger car** market in China
- BYD **transfers own know-how from lithium-ion battery** mass-production for mobiles **to production for electric vehicles**
- **Advanced development status** for EVs **led to first cooperations internationally** w. VW, Mercedes and China's Southern Power Grid

### CONCLUSIONS

**Established players have to** adjust their current business model to **support the mobility needs** of the end consumers **with additional services/packages in future**

**Matured OEMs have to** rethink their own specification requirements for different markets and have to find & **develop tailored solutions for the needs of the 'new' markets locally**

Due to the innovation power in BRIC nations **established OEMs** have to analyze the trends/developments carefully and **may need strategic partnerships to close own development gaps/deficits**

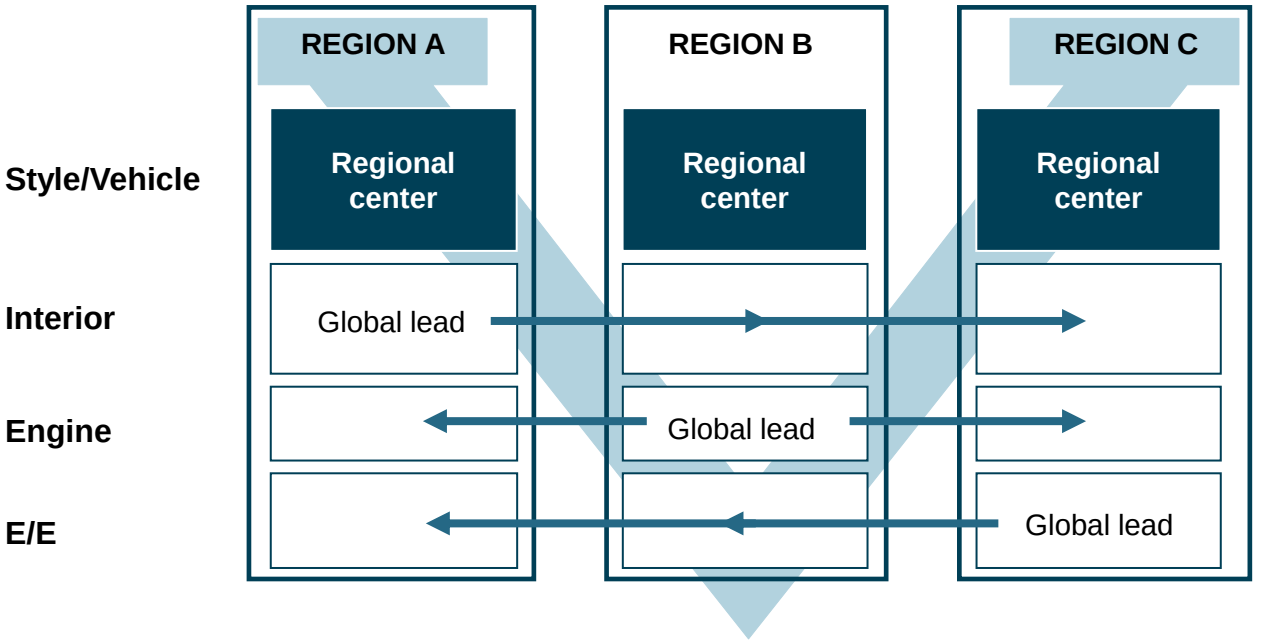
Source: Roland Berger

# C. GLO/CAL BUSINESS ORGANIZATIONS

Roland Berger
Strategy Consultants

# Glocal engineering centers – Decentralized regional engineering footprint balanced with global coordination

## Engineering centers in the future




## COMMENTS

- **Global coordination** of regional engineering centers
- **Regional footprint** with decentralized organization
- **Local design specificities** managed by regional center
- **Global/standards components** defined on a global base and lead by a given region

Source: Roland Berger

# C. INDUSTRY FLEXIBILIZATION

Roland Berger
Strategy Consultants

# A tale of two worlds: Automotive vs. "classic" IT applications

## AUTOMOTIVE IT APPLICATIONS

**OPEN**

**CLOSED**

- Proprietary technology; walled garden; one dedicated "device"
- Development in "closed shop"
- Reliability/security as main design factor
- Technology stack only partly delayered

## INFORMATION TECHNOLOGY APPLICATIONS

**OPEN**

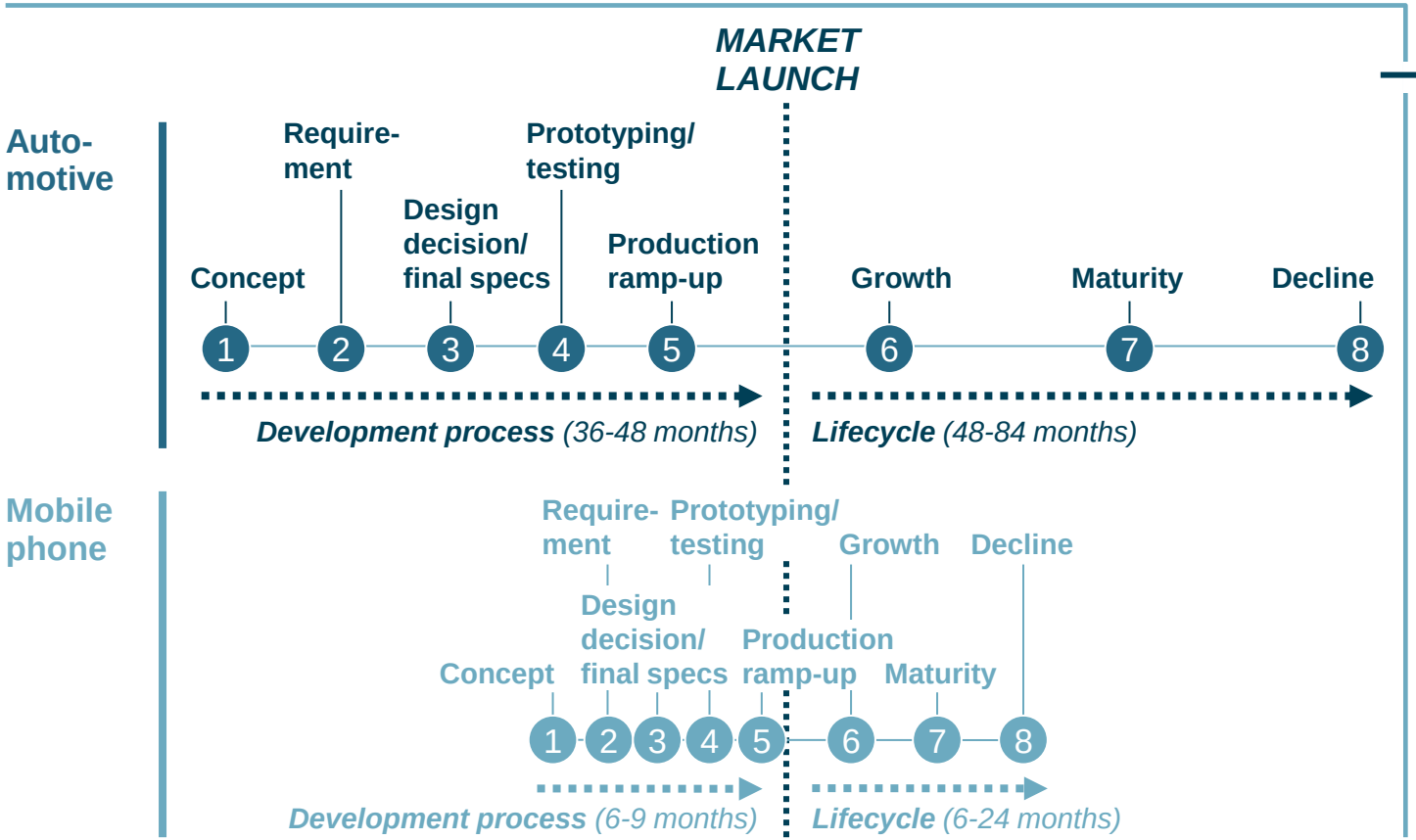
- Ecosystem with many stakeholders and devices
- Open development platforms
- Highly customized/customiz-able; upgrade via update
- Fully delayered technology stack

**CLOSED**

Source: Roland Berger

# Increasing convergence of automotive and IT products requires a stronger alignment of both industries

Timeline of product development processes: Automotive vs. IT




## COMMENTS

- Challenge for automotive and IT industry to synchronize the product develop-ment processes with each other
- Especially with regard to electric/ electronics
- Currently OEMs use the shorter facelift process (12-24 months) or model year process

Source: Roland Berger

# C. PROLIFERATION MEETS CONSOLIDATION

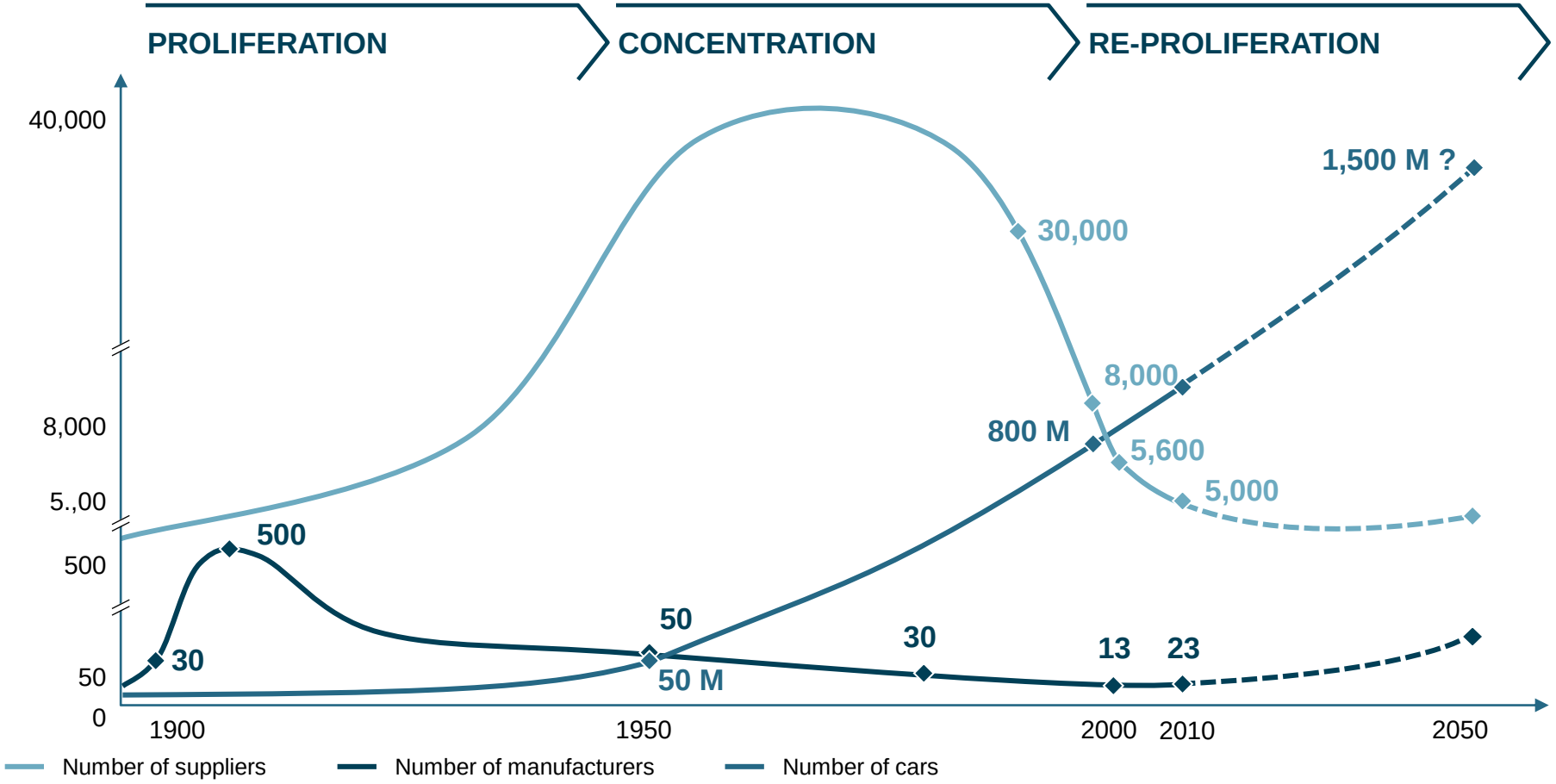
Roland Berger
Strategy Consultants

Amrop

Roland Berger
Strategy Consultants

# The number of major OEMs has declined in the past decades – But re-proliferation may be expected

Industry proliferation/consolidation trends



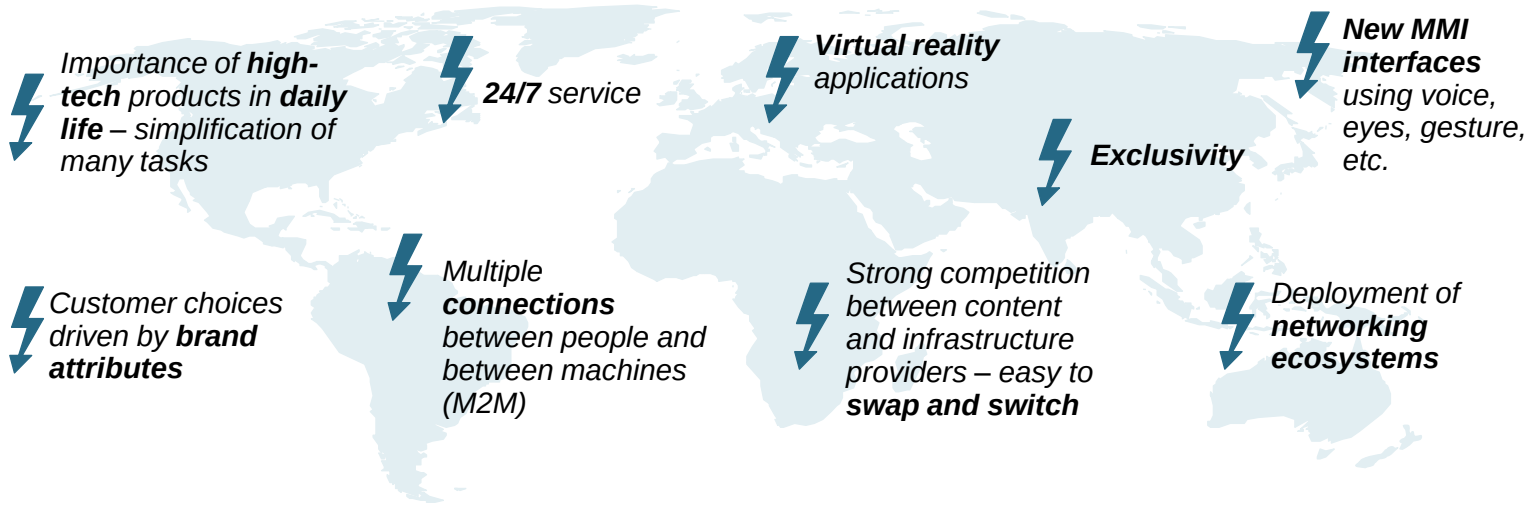

Source: Automobilproduktion, University of London, Roland Berger


# D. Scenarios

Roland Berger
Strategy Consultants

# High-tech scenario – Innovation, connectivity, technology-driven world

## HIGH-TECH WOLRD




## Implications for the automotive industry

**Main vehicle features**
- Connectivity (Internet on board, Web-based services)
- MMI
- Highly personalized
- Complex E/E systems: active safety, driving assistance, etc.

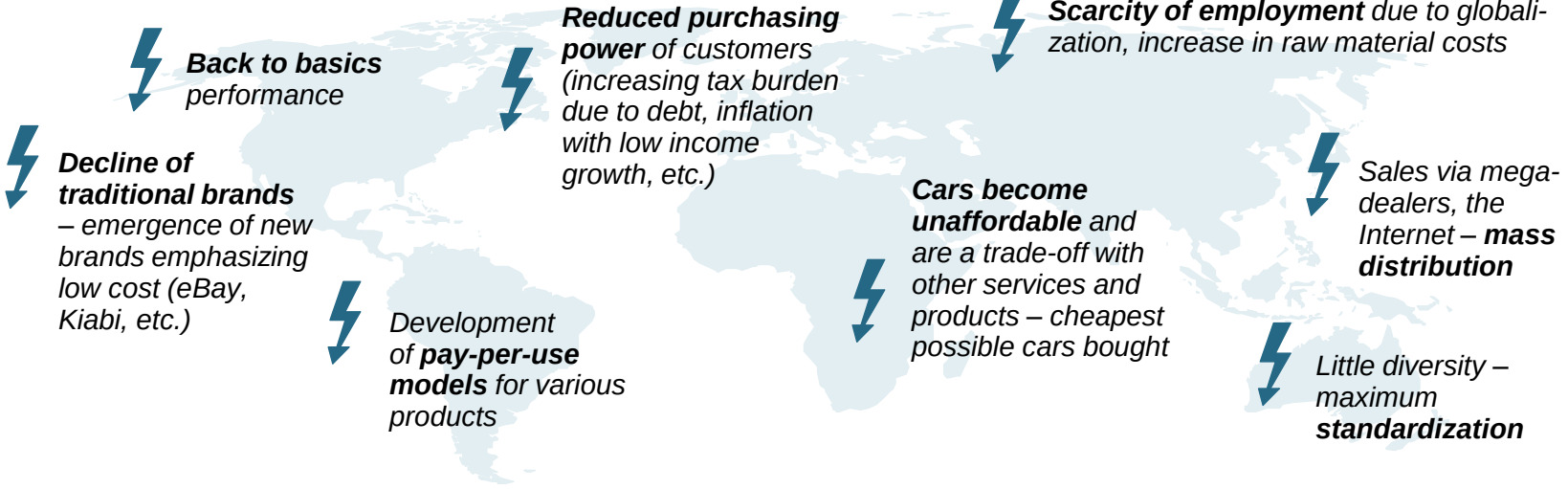
**Brand**
- Strong OEM brands associated with a technology mindset and exclusivity

**Marketing**
- Strong use of CRM with customers, going beyond the product (viral marketing, community-based, etc.)

Source: Roland Berger

# Budget scenario – Money for the basics only

## BUDGET WORLD




## Implications for the automotive industry

**Main vehicle features**
- Low-cost cars
- Decontenting on power and weight, increase in E/E features
- Mobility services models, emphasis on low TCO
- Cars defined by customer needs (target costing)
- Additional features as options (high level of diversity)

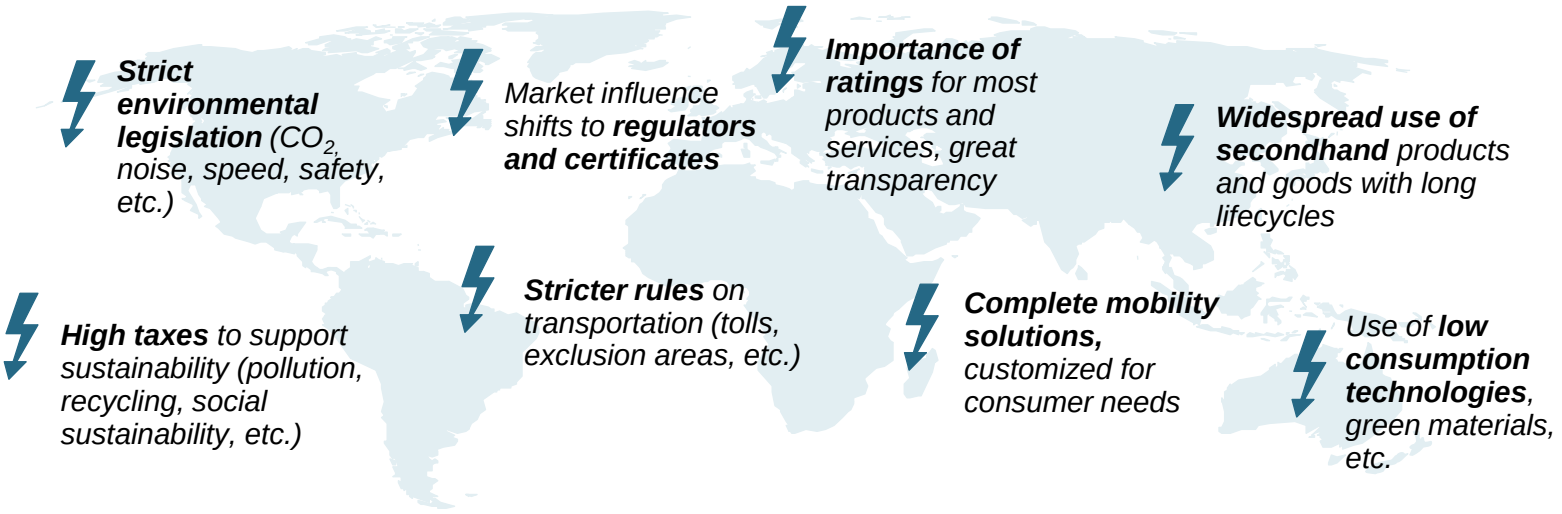
**Brand**
- New low-cost brands emerge

**Marketing**
- Affordable cars from new private-label brands belonging to mega-dealers and large retailers (Walmart, Decathlon, etc.)

Source: Roland Berger

# Sustainability scenario – Maximum regulation and environmental lobbying

## SUSTAINABLE WORLD




### Implications for the automotive industry

**Main vehicle features**
- Compliance with all legislation
- Differentiation by rating agencies or labeling
- Mobility solutions focusing on TCO
- Rapid introduction of green cars (EVs & plug-in hybrids)

**Brand**
- Cars distributed through leasers, utilities (EVs) and insurance companies specifying the model required

**Marketing**
- Emergence of new mobility services providers offering products and services

Source: Roland Berger

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Roland Berger
Strategy Consultants

# Whatever the scenario, some common key success factors will become crucial

| KEY SUCCESS FACTORS | I "Budget" world | II "Sustainability" world | III "High-tech" world |
|---|---|---|---|
| Brand | Clear brand positioning and customer targets with a globalized approach | | |
| Product | Tailored design to specification, leveraging both high content features (eg. connected cars, ..) and low content features, greater level of customization to needs. Product & service approaches going toward customer relationship and are also offering mobility solutions | | |
| Opera-tions | Glo/cal R&D approach and network, modularization, mix of more flexible plants and LCC plants. Capacity management driven by profitability | | |
| Partners | Strong relationships with well chosen partners: downstream (distribution, services providers), upstream (Tier-1), co-branding partners | | |

Source: Roland Berger


# E. Conclusion

Roland Berger
Strategy Consultants

# Over the coming 15 years, the automotive industry will undergo the greatest transformation it has experienced in its history

**The upcoming changes are fundamental & affect all players** of the automotive industry – OEMs, suppliers, third parties, both new & established players:

- **A dramatic production & sales shift to the Asian markets** will take place – quickly and permanently
- The **Asia demand supports low-cost cars** as an important entry point **as well as A/B segment cars** in general – This segment will also grow in mature markets, where values are changing
- **Cars will lose their appeal for younger generations in developed countries**. In major urban areas, car ownership will become unnecessary – **Mobility ecosystems will provide cars on demand**
- The cars in question will mainly be electric – **50% will have a fully or partially electrified powertrain**
- Many vehicles will be **permanently online** via the Internet – **Connectivity will be key**
- The **automotive industry will converge with other industries** – companies will **engage in multiple partnerships** as a way of accessing technology and customers and securing economies of scale
- **New business models and value chain partners will emerge**, challenging the status quo, especially where they come from sectors other than the automotive industry
- Players **will move away from centralized organizations** in the pursuit of size and access to fresh sources of engineers and other specialists – **they will begin to operate glo/cally**
- **Consolidation will continue among OESs** – **new OEMs are likely to emerge** from different industries

The key is for all **companies to remain open & flexible** – they must **think & act holistically in order to benefit** from the opportunities ahead

Source: Roland Berger